The Global Initiative on Late Blight 2000

GLIB is a worldwide network of researchers and technology developers working to control late blight

GILB STAFF

Wanda Collins, GILB Coordinator

Charlotte Lizárraga, Assistant GILB Coordinator

Bertha Ferreyros, GILB Information System Manager

GILB PRIORITIES

Breeding for host resistance

Pathogen studies

Integrated pest management of late blight (IPM-LB)

Training

Information

Introduction

Potato late blight, caused by *Phytophthora infestans*, continues to be the most destructive disease attacking potato. New more aggressive and fungicide-resistant forms of the pathogen have evolved and are rapidly spreading throughout the world. The goal of the GILB (Global Initiative on Late Blight) is to reduce this threat to the potato crop, especially in less developed countries, through stimulating collaborative, complementary research and technology transfer between developing and industrialized countries. GILB unites people with similar interests in late blight through its geographical and thematic Linkage Groups. A Steering Committee sets GILB's policies and GILB is coordinated from the International Potato Center (CIP), Lima, Peru.

GILB Linkage Groups

During the GILB Conference held in March 1999 in Quito, Ecuador, participants formed regional and thematic Linkage Groups to enhance communication and cooperation. The Linkage Groups, which are currently active, are:

Geographical: Africa, East and Southeast Asia, Europe, Latin America, Southwest Asia, and USA and Canada

Thematic: Breeding, Integrated pest management of late blight (IPM-LB), Molecular studies of the late blight pathogen and Variation and Evolution of *Phytophthora infestans*

These groups form the foundation of GILB. Their activities in 2000 are summarized in the following pages.

Africa

The Sub-Saharan Africa (SSA) Linkage Group organized a special meeting to prioritize activities during the African Potato Association meeting held 29 May – 2 June 2000 in Kampala, Uganda. The members present agreed that the GILB SSA Linkage Group should be expanded to include all of Africa and be called the Africa Linkage Group. Coordination and research on late blight in Africa was discussed and seven priority areas were identified.

- Standardization of late blight evaluation techniques
- Continuation of Standard international field trials (SIFT)
- Characterization of *Phytophthora infestans* in key areas
- Development/strengthening of regional capacity for characterizing *P. infestans*.
- Evaluation of research on fungicides
- Evaluation of the influence of weather on late blight disease and of the use of satellite weather data.
- Studies on alternate hosts of the late blight pathogen.

Members, who came from Burundi, Cameroon, Ethiopia, Ghana, Kenya, Mauritius, Rwanda, South Africa and Uganda, decided to form operational working groups to initiate proposal writing for funding of priority research. The following working groups were formed, each with a leader:

- Host resistance breeding, Ramzy El-Bedewy (CIP-NBO@cgiar.org), Kenya
- Population dynamics of *P. infestans*, Modesto Olanya (m.olanya@cgiar.org), Kenya
- Integrated pest management of late blight (IPM-LB) and fungicide optimization, Theresa Sengooba (naari@naro.bushnet.net), Uganda

These groups will help identify breeders currently working on late blight in Africa, the *P. infestans* populations found in certain countries, and the fungicides in use in those particular countries. Members noted that forecasting systems and Geographical Information Systems (GIS) models need careful consideration due to weather variation in tropical areas. They agreed that an inventory of human resources and infrastructure in each country was needed.

The members selected J J Hakiza (jjhakiza@imul.com), Uganda, Adipala Ekwamu (acss@starcom.co.ug), Uganda, and Modesto Olanya as Contacts for the Africa Linkage Group.

East and Southeast Asia

The East and Southeast Asia (ESEA) Linkage Group sponsored a workshop on late blight, 16–19 August 2000 in Baoding, Hebei, China. Zhang Zhiming (zhangzhm@bdinfo.net), the ESEA Linkage Group Contact and representative for China, chaired the workshop. Leaders from the Chinese Government and the Hebei Agricultural University welcomed the 44 participants, including invited country representatives Sok Vannthan (ciap@bigpond.com.kh), Cambodia; Masayasu Kato (mkato@cryo.affrc.go.jp), Japan; Maung Maung Myint (dap.moai@mptmail.net.mm), Myanmar, Zenaida Nisperos Ganga (tater@skyyyinet.net), Philippines;and Pham Xuan Tung (tung.ctp@hcm.vnn.vn), Vietnam. The invited guest speaker was H R Forrer (hans-rudolf.forrer@fal.admin.ch), Switzerland. The workshop covered a wide range of issues on potato late blight, including host plant resistance to the late blight pathogen; general pathogen studies; prediction models for late blight to facilitate its control; IPM-LB; transgenic plants with resistance to late blight; and participatory approaches for collaborative field research in farmers' fields.

The members of the ESEA Linkage Group met during the workshop to discuss future priorities, including information and material exchange, training activities (IPM-LB, mating type and race identification), the development of methods for predicting late blight epidemics and grant applications.

The group plans a training course in 2001 on *P. infestans* mating type assessment, the use of the short-term late blight forecasting program PhytoPre, and evaluation of host resistance.

Europe and Breeding

The Europe and Breeding Linkage Groups met on 4 July 2000 as a satellite event of the joint meeting of the EAPR (European Association for Potato Research) Section: Breeding and varietal assessment, with the EUCARPIA (European Association for Research on Plant Breeding) Section: Potatoes. The meeting was held at the Plant Breeding and Acclimatization Institute (IHAR), Warsaw, Poland. About 100 participants from 21 countries attended the GILB meeting. John Bradshaw (jbrads@scri.sari.ac.uk), UK, is the Contact for the Breeding Linkage Group. Jim Duncan (j.duncan@scri.sari.ac), UK, and Francine Govers (francine.govers@fyto.dpw.wag-ur.nl), Netherlands, are Contacts for the Europe Linkage Group.

The program for the GILB meeting included short presentations by George Mackay, UK, on GILB and its priorities; John Bradshaw on goals and initiatives of the Breeding Group; and Ewa Zimnoch-Guzowska, Poland, on the status of the Central and Eastern European Network for Potato Research (CEENP) late blight project. The presentations stimulated a lively debate on the best structure for the Internet database to be developed by GILB for scientists and breeders seeking sources of resistance to late blight. Anatolij Podgaetsky, Ukraine, talked about national achievements in breeding for late blight resistance, and David Shaw (d.s.shaw@bangor.ac.uk), UK, Contact for the Variation and Evolution of *P. infestans* Linkage Group, described efficient methods for studying pathogen characteristics.

GILB sponsored the participation of two scientists from Eastern Europe: Lenuta Rakosy-Tican, (Romania) and Anatolij Podgaetsky (Ukraine).

Latin America and Integrated Pest Management of Late Blight

The Latin America and the IPM-LB Linkage Groups, along with the Swiss-funded CIP-COSUDE (Swiss Agency for Development and Cooperation) Papa Andina Project, CIP and PROINPA (Foundation for the Promotion and Research of Andean Products, Bolivia), sponsored a workshop, *Complementing Resistance to Late Blight in the Andes,* 13–16 February 2001 in Cochabamba, Bolivia. Most of the 36 participants were from Bolivia, Peru and Ecuador, and key individuals came from other countries such as Argentina, Colombia, Netherlands, Venezuela and the USA.

Linkage Group Contact Marcelo Huarte (huarte@balcarce.inta.gov.ar) from Argentina opened the workshop with a summary paper on breeding. Huub Schepers, representing the European network for the development of an integrated control strategy of late blight, spoke on the state of the art in decision support systems.

The workshop program included:

- Presentations of country profiles on the situation of late blight across the Andes
- Presentations on the state of the art of integrated management of late blight (including baseline studies of fungicide use, simulation approaches and managing resistance to fungicides, helping farmers reduce pesticide use, the CASTOR program [software for weather data management and late blight modelling], effects of nitrogen, farmer field schools and field guides)
- A field visit to PROINPA's demonstrations of strategies and options for managing late blight and farmer field schools, followed by feedback sessions
- Working groups on cultural practices; fungicide use and decision support systems for managing late blight; participatory research and training in IPM-LB
- Plenary discussions of the main topics of the workshop
- Development and approval of a strategy for funding research in Andean countries on IPM-LB

The field day was well organized by PROINPA and visitors made many constructive comments about the PROINPA strategy for managing late blight and farmer field schools.

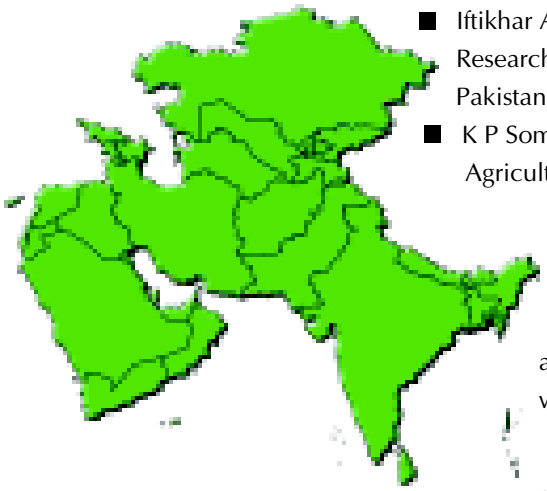
The working groups identified some important advances and major knowledge gaps. There was a consensus that additional funding is required if progress is to be made in addressing the gaps, and that a collaborative project involving several countries could possibly address this need. In response, a project development group, including Greg Forbes and Graham Thiele (CIP), Julio Gabriel (Bolivia), Marcelo Huarte (Argentina) and Enrique Fernandez-Northcote (Peru) prepared a draft concept note for a project under GILB involving specific research and development topics related to late blight management in Latin America, especially in the Andes. During the final plenary session, the workshop participants agreed that the concept note should be finalized for presentation to interested donors.

The workshop proceedings will be published in Spanish, and later in English. A CD-Rom of the proceedings and of the slide presentations will be produced.

Southwest Asia

The Southwest Asia Linkage Group has officially recognized country representatives from five national research institutions:

- Mohammad Hossain (baridg@bttb.net; Tuber Crops Research Centre, Bangladesh Agricultural Research Institute)
- Bir Pal Singh (cprsm@vsnl.com ; Central Potato Research Institute, India)
- Sunder K Shrestha (plpatho@khumal.mos.com.np; National Agricultural Research Council, Nepal)



- Iftikhar Ahmad (ifti@cdri_isb.sdnpk.undp.org; Crop Disease Research Institute/National Agricultural Research Centre, Pakistan)
- K P Somachandra (ddrbwela@sri.lanka.net; Regional Agricultural Research and Development Centre, Sri Lanka)

Bir Pal Singh, Linkage Group Contact and representative for India, requested reports on the late blight situation in each of these countries. Four reports are summarized below. The group plans to hold a workshop this year in Nepal.

Bangladesh. Late blight was first reported in 1922 and occurs throughout the country wherever potatoes are grown. Severe epidemics have occurred in Rangpur (1970–71), Munshigonj (1972– 73, 1987–88, 1992–93), Bogra (1998–87, 1992–93) and Comilla (1992–93). The *P. infestans* population is primarily A2 and its physiological races have one to three avirulence genes. The avirulence genes detected are R_1, R_2, R_3, R_4, R_5, R_6 and R_7 and 18 races of *P. infestans* have been recorded. In a study conducted during 1995–96, seven out of 20 *P. infestans* isolates were resistant to metalaxyl. Potato cultivars Serrana and DTO-33 and true seed progenies (CIP 87.272, CIP 87.606 and CIP 87.616) were resistant to late blight under conditions of artificial inoculation in both laboratory and screenhouse tests.

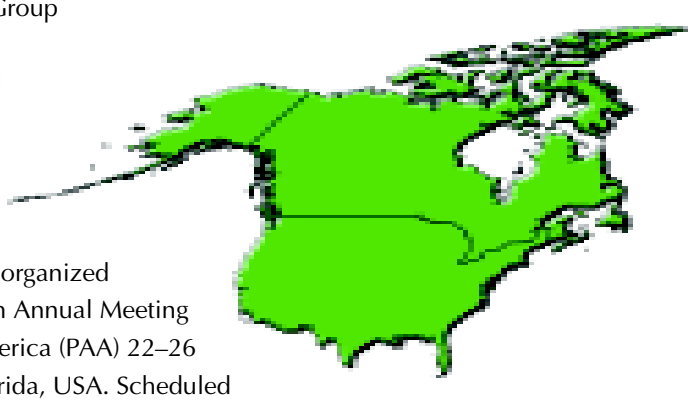
India. Late blight occurs regularly both in the hilly regions of the country and on the sub-tropical Indo-Gangetic plains, causing heavy crop losses. The disease is more severe and occurs more frequently in the northeastern hills where the weather is favorable to the pathogen. The A2 mating type was first detected in the northwestern hills in 1990 and since 1995 the *P. infestans* population has stabilized to approximately 90% A2. The A2 mating type has completely replaced the A1 in the northeastern hills, while the populations in the Indo-Gangetic plains are nearly 50% A1/A2 and there are regions where A2 has not yet been reported. Complex *P. infestans* physiological races with four to eight avirulence genes have evolved and replaced the simple races in the hills, but races on the plains are less complex. Mating type has not been correlated with aggressiveness. Contrary to the situation in Europe, the A2 mating type strains in India are still susceptible to metalayxl. Conventional breeding efforts have produced more than a dozen late blight resistant varieties, which have been deployed throughout the country.

Pakistan. Although late blight is one of the most damaging diseases of potato, late blight incidence was very low during 1999–2000 because the weather was dry. The disease was first reported in 1984 in Kalam and Malam Jabba. It occurs on the plains of Punjab and the North West Frontier Province and, more recently, in the Balluchistan area and northern Pakistan, where the microclimate was previously considered unfavorable for development of the

disease. Isolates of *P. infestans* from the Punjab collected during 1999–2000 were 52.5% A1, 17.5% A2 and 30% self-fertile. The *P. infestans* physiological races have three to four avirulence genes. The avirulence genes detected are R_1, R_3, R_4 and R_7. Genotypes of *P. infestans* that are unable to infect the potato differentials (for determining the presence of avirulence genes) have been identified. Of the isolates 75% had intermediate resistance to metalaxyl, 22.5% were resistant and 2.5% were sensitive. Half (50%) of the 45 isolates characterized by SDS-polyacrylamide gel protein electrophoresis were similar to four isolates from Cornell University, USA. Presently, a subset of these isolates is being characterized using nucleic acid analysis techniques. The National Potato Program, NARC, Islamabad, is screening germplasm obtained from CIP for late blight resistance and 12 resistant clones have been identified.

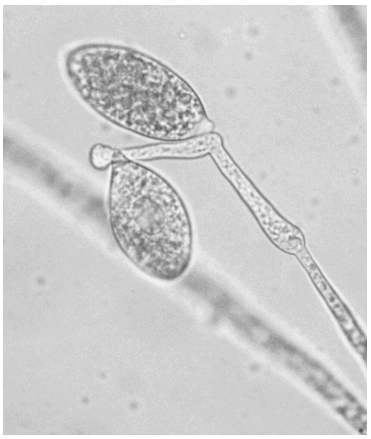
Sri Lanka. Late blight is the main limiting factor in the highlands of Nuwara Eliya and Welimada. Most of the varieties grown commercially are of European origin and susceptible to the disease. The two resistant varieties, Sita and Krushi, are unpopular because they have a 4 1/2 month vegetative period and seed is unavailable. Most farmers use fungicides regularly with 12–15 sprays in the wet season and six to eight in the dry season. Ongoing research includes screening for host resistance, testing chemical control measures, and *P. infestans* population studies. The *P. infestans* population is mainly A1; the A2 mating type has been found only on imported seed of potato cultivars Maranka and Agria in one location. According to two surveys conducted in the highlands, the *P. infestans* physiological races have increased in complexity from one to five avirulence genes in 1996 to four to eight in 1998. In Rahangala, a physiological race with nine avirulence genes was found in 1996 and in 1998 all 11 known avirulence genes were detected. Late blight resistance screening of tuber families from CIP resulted in the selection of lines 241, 245 and 246, originating from the CIP 34-8 progeny, which have remained resistant under both heavy rainfall and drier weather conditions.

USA and Canada



The USA and Canada Linkage Group Contacts are H. W. (Bud) Platt (Platth@em.agr.ca), Canada and David Douches (douchesd@pilot.msu.edu), USA. A GILB-sponsored mini-symposium, " *Late blight is a global problem*" was organized and will be held during the 85th Annual Meeting of the Potato Association of America (PAA) 22–26 April 2001 in St. Augustine, Florida, USA. Scheduled presentations include overviews on GILB, the late blight situations in the USA and Canada, Ireland and Europe, Latin America, Africa and Asia, and the significance of sexual reproduction in *Phytophthora infestans*. Wanda Collins, GILB Coordinator, will preside at the event.

Molecular Studies of the Late Blight Pathogen



The Molecular Studies of the Late Blight Pathogen Linkage Group consists of researchers involved in molecular genetic research on *P. infestans* at universities or research institutes. An important activity is the organization of satellite meetings and workshops at international meetings because most molecular genetic studies on Oomycetes are done with *Phytophthora*, in particular *P. infestans*. The group will met during the 21st Fungal Genetics Conference 13–18 March 2001 at the Aislomar Conference Center, Pacific Grove, CA, USA. Other activities include the exchange of research material such as strains of P. infestans, genomic libraries, cDNA libraries, clones, etc. The Linkage Group Contact is Francine Govers, Netherlands (E-mail:francine.govers@fyto.dpw.wag-ur .nl).

Variation and Evolution of *Phytophthora infestans*

The Variation and Evolution of *Phytophthora infestans* group intends to provide mutual support and encouragement for researchers on all aspects of the evolution of *P. infestans* populations world wide. Three electronic mailing lists for discussion groups have been set up:

- Blightec for methods, technical problems and development of molecular methods for characterization of isolates, suitable for use where expertise and equipment are limited.
- Blightevol for debate of general issues like the reliability or value of certain techniques and concepts.
- Blightrain for assisting with grant applications and networks for joint grant applications; encouraging student and staff training in new methods; and organizing training workshops, meetings or symposia. The Linkage Group Contact is David Shaw, Wales, U K. (d.s.shaw@bangor.ac.uk).

Global Late Blight

At the GILB'99 conference, GILB members overwhelmingly agreed that information is their most critical need, especially in developing countries. Information needs include databases on resistance genes/resistant cultivars, segregating populations, currently available molecular markers, *Phytophthora infestans* populations and their characterization, bibliographic references and relevant laboratory techniques. A directory of people interested and working in particular areas and a catalog of available resistant materials would also be valuable. GILB has responded to this need by initiating the Global Late Blight Information System. This system

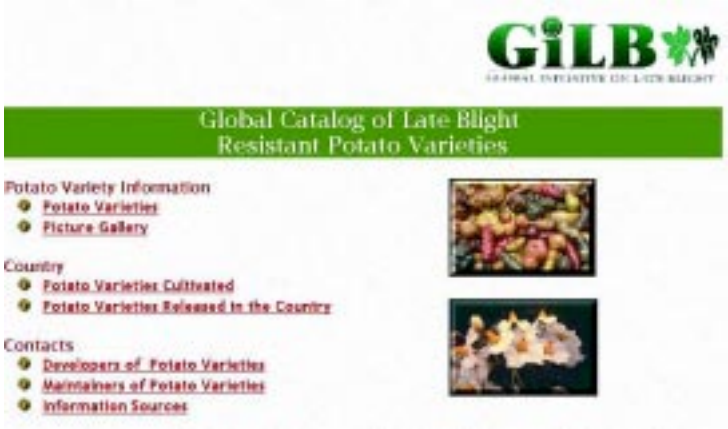
will be set up as a homepage on the GILB website and maintained by GILB's Information System Manager. It will serve as an umbrella page to link all the existing information sources developed by GILB Linkage Groups. It will also solicit and develop additional databases and information sources. This GILB Late Blight Information System should be available by midyear 2001. Examples of some of the components to be brought together are described below.

GILB contacts

- Lists of GILB contacts by countries in each regional Linkage Group have been posted on their respective webpages (http://www.cipotato.org/gilb/linkgps/regional.htm). Information on the research interests of each contact will be added during 2001.
- The IPM-LB (integrated pest management of late blight) contact list is organized by country and is posted at http://www.cipotato.org/gilb/linkgps/ipmLB.htm
- Contact information for breeders working on late blight, and details of their respective programs is posted at http://www.cipotato.org/gilb/linkgps/breeding.htm

Catalog of resistant potato varieties

To date this database contains 924 entries from 62 countries, including information on progenitors, developer, maintainer, country of release, year of release, countries where cultivated, type of resistance (foliage, tuber, general), use (industry, food), category of intellectual property protection, information source and images of each variety. Users will be able to search by variety, by country, by developer and by maintainer. This catalog will be published at the GILB web address and will be available in hard copy for those lacking access to the Internet. Plans are to have it ready by midyear, 2001.



Other databases

- The Global Marker Database for *Phytophthora infestans* created by Forbes et al, 1998 (Plant Disease 82: 811-18) incorporating RFLP data has been modified and the database will be posted at the Variation and Evolution of *P. infestans* Linkage Group webpage: (http://www.cipotato.org/gilb/linkgps/pathvar.htm)
- Stephen P. Goodwin, Purdue University, IN, USA, has donated his *Phytophthora* bibliography as a basis for a searchable database available at the GILB web address and on CD-Rom. Hard copy will be provided on request.
- Molecular marker databases and relevant laboratory techniques will be available online or linked to the GILB web. Hard copy provided on request.

GILB'02

The third GILB international conference will be held in Hamburg, Germany in 2002 in conjunction with the 15th Triennial Conference of the European Association of Potato Research. The EAPR meeting will be held 14–19 July; GILB will organize its conference just before that date. Additional information will be forthcoming in the GILB Newsletter.

GILB supported research

Phytophthora infestans populations in Bolivia, Ecuador, Peru, Kenya and Uganda

An update on this research, which the first GILB Steering Committee considered essential and which GILB has partially or fully supported since 1997, appeared in the *GILB Annual Report 1999*. Below are journal articles to date on the results of this work.

- Ordoñez M E, Hohl H R, Velasco J A, Ramon M P, Oyarzun P J, Smart C D, Fry W E, Forbes G A, and Erselius L J. 2000. A novel population of *Phytophthora,* similar to *P. infestans,* attacks wild *Solanum* species in Ecuador. Phytopathology 90:197-202.
- Erselius L J, Vega-Sánchez M E and Forbes G A. 2000. Stability in population of *Phytophthora infestans* attacking tomato in Ecuador demonstrated by cellulose acetate assessment of glucose-6-phosphate isomerase. Plant Disease 84:325–327
- Vega-Sánchez M E, Erselius L J, Rodríguez A M, Bastidas O, Hohl H R, Ojiambo P S, Mukalazi J, Vermeulen T, Fry W and Forbes G. 2000. Host adaption to potato and tomato within the US-1 lineage of *Phytophthora infestans* in Uganda and Kenya. Plant Pathology 49: 531-39.
- Perez W G, Gamboa J S, Falcon Y V , Coca M, Raymundo R M and Nelson R. Genetic structure of Peruvian populations of *Phytophthora infestans*. Phytopathology. In Press.

GILB WEB

The GILB homepage is located at http://www.cipotato.org/gilb.htm There is information about GILB and its Linkage Groups, the Proceedings of the GILB'99 Conference, the 1999 Annual Report, the new GILB flyer and current and back issues of the GILB Newsletter (published three times yearly). If you would like to subscribe to the Newsletter by E-mail or regular mail, or if you would like additional information about GILB, please contact the GILB Coordinator at gilb@cgiar.org (GILB, P.O. Box 1558, Lima 12, PERU).

GILB Steering Committee Members

March 2000 – January 2001

Dr. Ewa Zimnoch-Guzowska
Chair of the GILB Steering Committee
Plant Breeding and Acclimatization Institute
Mlochow Research Center
05 832 Rozalin
Mtchow, Gm. Nadarzyn
Warsaw, POLAND
email: e.zimnoch-guzowska@ihar.edu.pl
Telephone: 48 22 7299248
Fax: 48 22 7299247

Dr. Wanda Collins
GILB Coordinator
Deputy General for Research
International Potato Center (CIP)
P.O. Box 1558
Lima 12, PERU
email: CIP-DDG-Research@cgiar.org
Telephone: 51 1 3496017
Fax: 51 1 3495638

Dr. Marcelo Huarte
INTA
C.C. 276 Balcarce
Buenos Aires 7620, ARGENTINA
email: huarte@balcarce.inta.gov.ar
Telephone: 54 2266 422040
Fax: 54 2266 421756

Dr. David Douches
Michigan State University
Dept. Crop and Soil Sciences
486 Plant and Soil Sciences
East Lansing, MI 48824, USA
email: douchesd@pilot.msu.edu
Telephone: 1 517 3556887
Fax: 1 517 3535174

Dr. Jim Duncan
Scottish Crop Research Institute
Fungal and Bacterial Plant Pathology Department
Invergowrie, Dundee DD2 5DA
UNITED KINGDOM
email: j.duncan@scri.sari.ac.uk
Telephone: 44 1382 568518
Fax: 44 1382 568578

Dr. Francine Govers
Wageningen University
Laboratory of Phytopathology
Binnenhaven 9
Wageningen 6709 PD
NETHERLANDS
email: francine.govers@fyto.dpw.wag-ur.nl
Telephone: 31 317 483138
Fax: 31 317 483412

Dr. John Hakiza
National Agricultural Research Organization
Kalengyere Res. Sta.
P.O. Box 722
Kabale, UGANDA
email: jjhakiza@imul.com
Telephone: 256 486 23439
Fax: 256 486 23935

Dr. He Wei
Sichuan Academy of Agricultural Sciences
Crops Institute
Chengdu, Sichuan 610066
PEOPLES REPUBLIC OF CHINA
email: hew@mail.sc.cninfo.net
Telephone: 86 28 4504696
Fax: 86 28 451 2025

January 2001 –

Dr H W (Bud) Platt
Chairman of the GILB Steering Committee
Agriculture and Agri-Food Canada
Research Branch, Research Centre
P O Box 1210
Charlottetown
P E I C1A 7MB, CANADA
Telephone: 1 902 566 6839
Fax: 1 902 566 6821
email: Platth@em.agr.ca

Dr Wanda Collins
GILB Coordinator
Deputy Director General for Research
International Potato Center (CIP)
P O Box 1558
Lima 12, PERU
Telephone: 51 1 349 6017
Fax: 51 1 3495638
email: CIP-DDG-Research@cgiar.org

Dr J J Hakiza
National Agricultural Research Organization
Kalengyere Research Station
P O Box 722
Kabale, UGANDA
Telephone: 256 486 23439
Fax: 256 486 23935
email: jjhakiza@imul.com

Dr He Wei
Sichuan Academy of Agricultural Sciences
Crops Institute
Chengdu, Sichuan 610066
PEOPLES REPUBLIC OF CHINA
Telephone: 86 28 450 4696
Fax: 86 28 451 2025
email: hew@mail.sc.cninfo.net

Dr David Douches
Michigan State University
Deptartment of Crop and Soil Sciences
486 Plant and Soil Sciences
East Lansing MI 48824, USA
Telephone: 1 517 355 6887
Fax: 1 517 353 5174
email: douchesd@pilot.msu.edu

Dr Jim Duncan
Scottish Crop Research Institute
Fungal and Bacterial Plant Pathology
Department
Invergowrie, Dundee DD2 5DA
UNITED KINGDOM
Telephone: 44 1382 568518
Fax: 44 1382 568578
email: j.duncan@scri.sari.ac.uk

Dr Francine Govers
Wageningen University
Laboratory of Phytopathology
Binnenhaven 9
6709 PD Wageningen
NETHERLANDS
Telephone: 31 317 483138
Fax: 31 317 483412
email: francine.govers@fyto.dpw.wag-ur.nl

Dr Zsolt Polgar
University of Veszprem
Georgikon Faculty of Agriculture
Regional Potato Research Centre
8361 Keszthely, PF 71
HUNGARY
Tel/Fax: 36 83-311-231
email: polg-zs@georgikon.hu

Dr Oswaldo Rubio
Programa Nacional de Papa
INIFAPConjunto SEDAGRO (CODAGEM)
Metepec, Edo de México
C P 52140 MEXICO
Telephone: 52 72 320089
Fax: 52 72 320089
email: oswaldorubio@terra.com.mx

Dr Bir Pal Singh[1]
Central Potato Research Institute
Post Box No. I4
Modipuram-250 110
Meerut U P INDIA
Tel: 0121 570742 (Office), 0121 570847 (Residence)
FAX: 0121 570084
email: cprsm@vsnl.com

[1] Awaiting official confirmation